R E M A R K S

Claim Amendments

Editorial revisions were made to claims 5, 8, 12 and 16.

Claims 18 to 20 were canceled.

With respect of Rule 116, entry of the amendments is respectfully solicited.

Presently Claimed Invention

Applicants' present claim 5 concerns a method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line, wherein a number of times of passage of the steel product through the induction heating apparatuses is such that a heat treatment time, in which a surface temperature of the steel product and a thickness-wise center temperature of the steel product are determined from the number of times of passage, a transfer speed of the steel product and an amount of electric power for the

induction heating apparatuses, fall within a predetermined range, becomes the shortest,

and wherein conditions in which the heat treatment time becomes the shortest are determined by the following steps:

(a) determining the dimensions of the steel product and a necessary temperature rise of the steel product to be subjected to the heat treating,

(b) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is one,

(c) determining the transfer speed and the electric power for the induction heating apparatuses when the number of times of passage is not less than two,

(d) selecting the optimum number of times of passage in which the heat treatment time becomes the shortest, and determining the transfer speed and the amount of electric power for the induction heating apparatuses for each of the selected optimal number of times of passage.

Applicants' present claim 8 is directed to a method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated

cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line,

wherein a number of times of passage of the steel product through the induction heating apparatus is such that a heat treatment time, in which a surface temperature and a thickness-wise center temperature of the steel product are determined based on the number of times of passage, a transfer speed of the steel product and an amount of electric power for the induction heating apparatuses fall within a predetermined temperature range within a target treatment time, and wherein conditions in which the heat treatment time falls within the target treatment time are determined by the following steps:

(a) determining the dimensions and a necessary temperature rise of the steel product to be subjected to the heat treating,

(b) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is one,

(c) determining the transfer of speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is not less than two,

(d) selecting the optimum number of times of passage, in which the heat treatment time falls within the target treatment time, and determining the transfer speed and the amount of electric power for the induction heating apparatus for each of the selected optimum number of times of passage.

Applicants' present claim 12 relates to a method of manufacturing a steel product comprising heat treating a steel product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line, and

a surface temperature of the steel product and a temperature in a predetermined position inside the steel product are each determined as a variable based on the number of times of passage, a transfer speed of the steel product and an amount of electric power for the induction heating apparatuses,

wherein the steel product is subjected to the heat treating so that a heat treatment time, until the surface temperature of the steel product does not exceed a predetermined upper limit temperature and the temperature in a predetermined position

inside the steel product reaches a target temperature, falls within a target treatment time,

and wherein conditions in which the heat treatment time falls within the target treatment time are determined by the following steps:

(a) determining the dimensions of the steel product and a necessary temperature rise of the steel product to be subjected to the heat treating,

(b) determining the transfer speed and the amount of electric power for the induction heating apparatus when the number of times of passage is one,

(c) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is not less than two,

(d) selecting an optimum number of times of passage, in which the heat treatment time falls within the target treatment time, and determining the transfer speed and the amount of electric power for the induction heating apparatuses for each of the selected optimum number of times of passage.

Applicants' present claim 16 pertains to a method of manufacturing a steel product comprising heat treating a steel

product which has been subjected to quenching or accelerated cooling on a hot rolling line after hot rolling by passing the steel product at least once through a plurality of induction heating apparatuses, which are installed on the hot rolling line,

a surface temperature of the steel product and a temperature in a predetermined position inside the steel product are each determined as a variable based on the number of times of passage, a transfer speed of the steel product and an amount of electric power of the induction heating apparatuses,

wherein the steel product is subjected to the heat treating so that a heat treatment time, until the surface temperature of the steel product does not exceed a predetermined upper limit temperature and the temperature in a predetermined position inside the steel product reaches a target temperature, becomes the shortest,

and wherein conditions in which the heat treatment time becomes the shortest are determined by the following steps:

(a) determining the dimension of the steel product and a necessary temperature rise of the steel product to be subjected to heat treating,

(b) determining the transfer speed and the amount of electric power when the number of times of passage is one,

(c) determining the transfer speed and the amount of electric power for the induction heating apparatuses when the number of times of passage is less than two,

(d) selecting the number of times of passage, in which the heat treatment time becomes the shortest, and determining the transfer speed and the amount of electric power for the induction heating apparatuses for each of the selected optimum number of times of passage.

Prior Art Rejections

Claim 18 was rejected under 35 USC 102 as being anticipated by or, in the alternative, under 35 USC 103 as being obvious over Hino et al. (EP 1359230 or WO 02/050317) (see the middle of page 3 of the March 16, 2009 Office Action).

This rejection is moot in view of the above cancellation of claim 18.

Claims 5 to 17, 19 to 20 and 22 to 29 were rejected under 35 USC 103 as being obvious over Hino et al. (EP 1359230 or WO

02/050317) (see the bottom of page 3 of the March 10, 2009 Office Action).

Differences Between Applicants' Present Claims 5, 8, 12 and 15 and Hino et al. (EP 1359230)

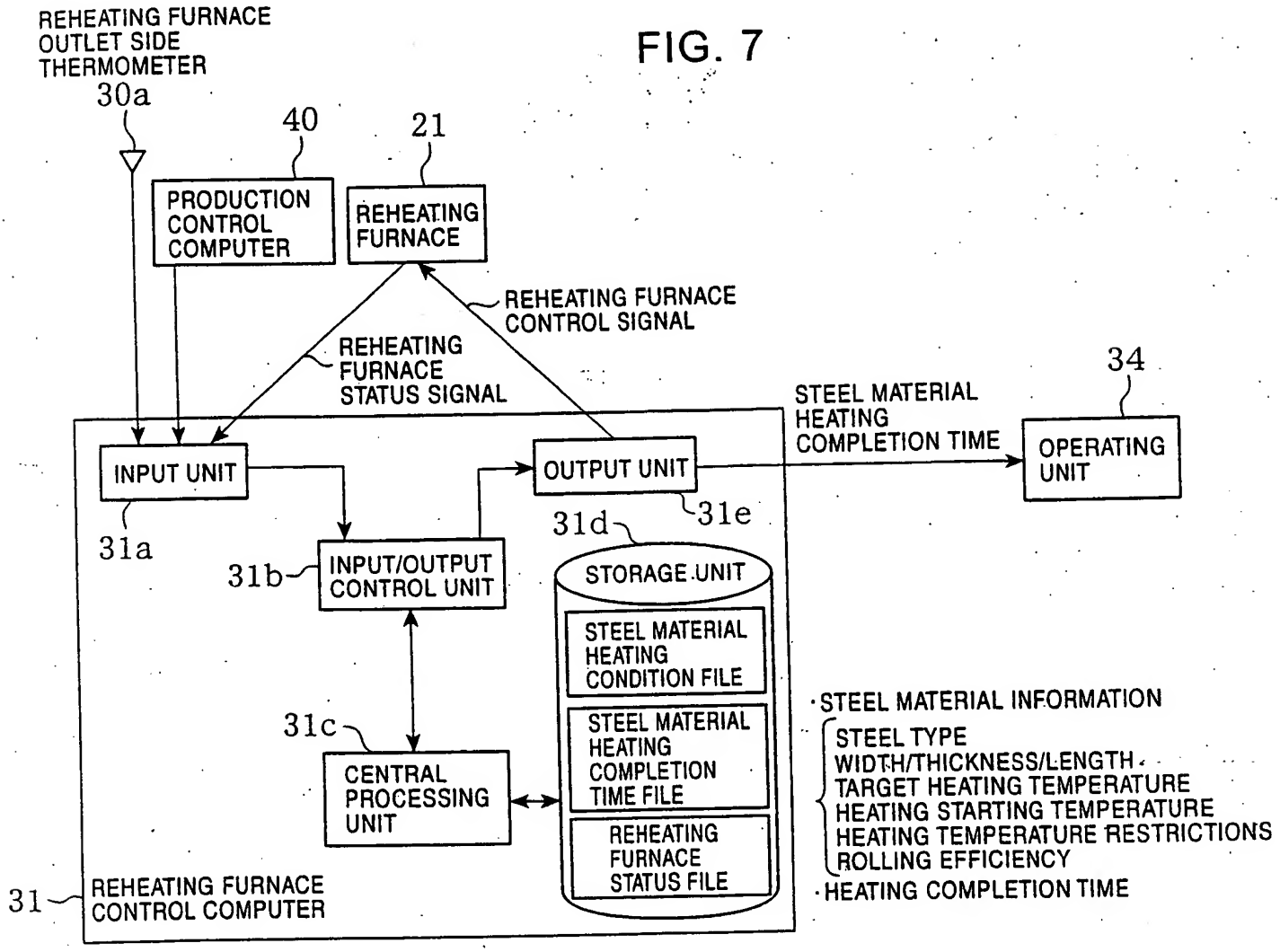
1) Input and Output

The input parameter and output parameter for processing according to applicants' claims 5, 8, 12 and 16 and according to Hino et al. are discussed hereinbelow.

Applicants' Claims 5, 8, 12 and 16

In applicants' independent claims 5, 8, 12 and 16, the electric power, the number of times of passage and the transfer speeds are calculated from the sizes of the steel materials, the heating temperatures and the maximum temperatures (see Fig. 7 in the present application, which is reproduced hereinbelow, and Fig. A provided hereinbelow).

FIG. 7



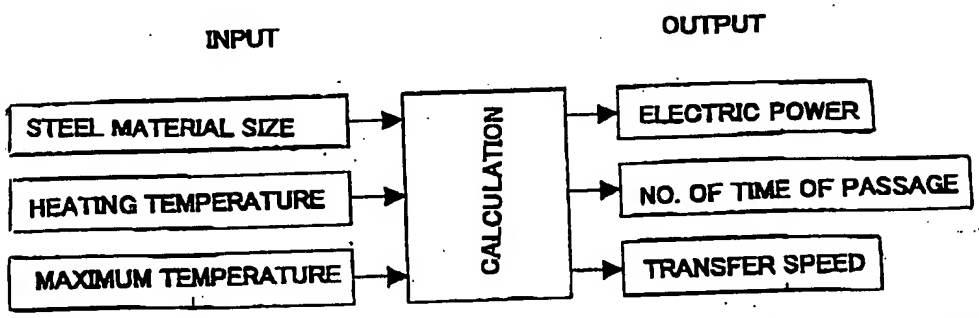


Fig. A INPUT / OUTPUT BY CLAIMS 5, 8, 12 AND 16 OF PRESENTLY CLAIMED INVENTION

Hino et al.

The electric power (P) is calculated from the sizes (H, W and L) of the steel materials, the heating temperatures (ΔT), the maximum temperature, the number of times of passage (M) and the transfer speeds (the rolling pitch Δt of the steel plates) (see the Equation (1) on page 4, lines 1 to 4 of Hino et al. and Fig. B provided hereinbelow).

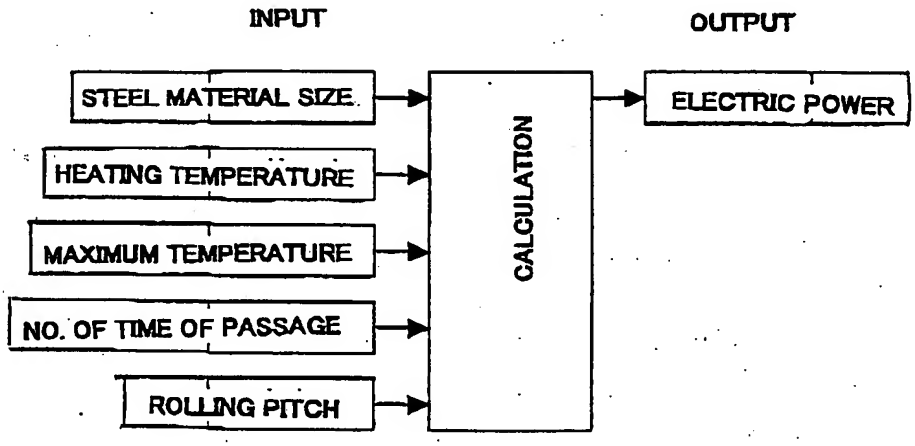


Fig. B INPUT / OUTPUT OF HINO ET AL.

The above-mentioned differences between the methods according to applicants's claims 5, 8, 12 and 16 and according to Hino et al. are evidenced by the following additional two types

of processing treatments that are necessary to be carried out to practically conduct heat treatments according to Hino et al:

(a) Processing through trial and error for obtaining the number of times of passage and the transfer speeds during heating (see paragraph nos. [0020] to [0022] on pages 3 to 4 of Hino et al.).

(b) Measuring the surface temperature and suspending the same when the surface temperature is likely to exceed the upper limit (see claim 2 on page 7 of Hino et al. and lines 1 to 3 in paragraph no. [0016] on page 3 of Hino et al.).

2) Flow of Processing

The differences in the flow of the processing when practically conducting heating between Hino et al. and the presently claimed invention are seen in the following Fig. C:

HINO ET AL. PRESENTLY CLAIMED INVENTION

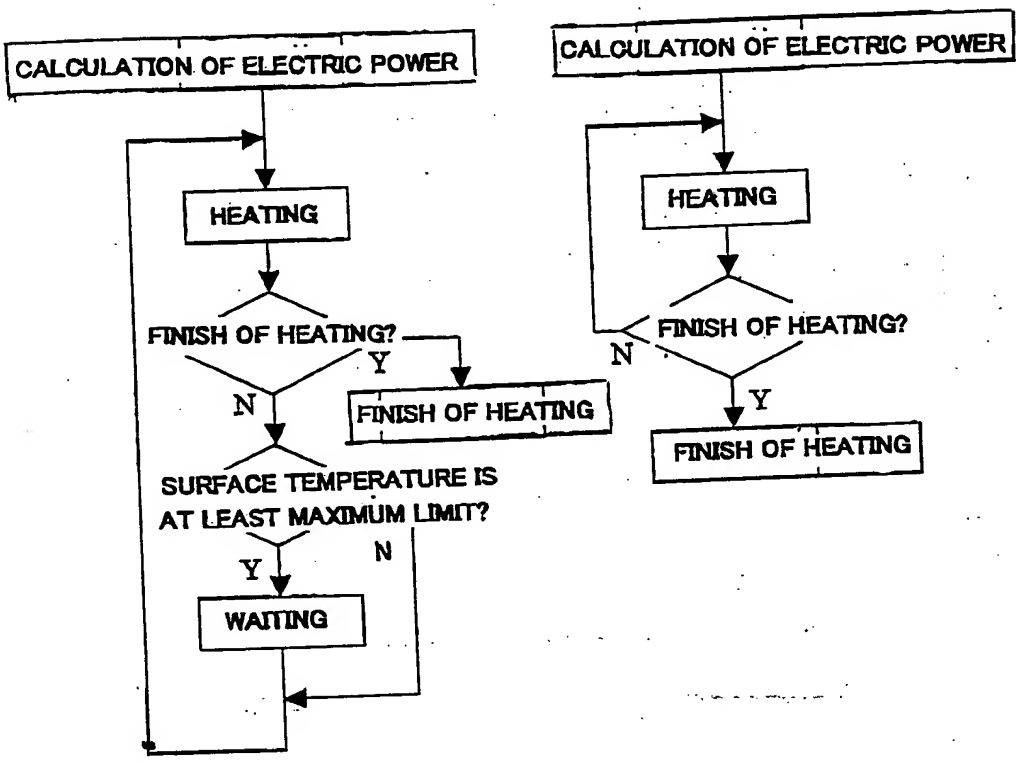


FIG. C DIFFERENCES OF PROCESS FLOWS BETWEEN APPLICANTS' CLAIMS 5, 8, 12 AND 16 (right diagram) AND HINO ET AL. (left diagram)

3) Movements of the Steel Material

The differences in the movements of the steel material between the presently claimed invention and Hino et al. are depicted in the following Fig. D.

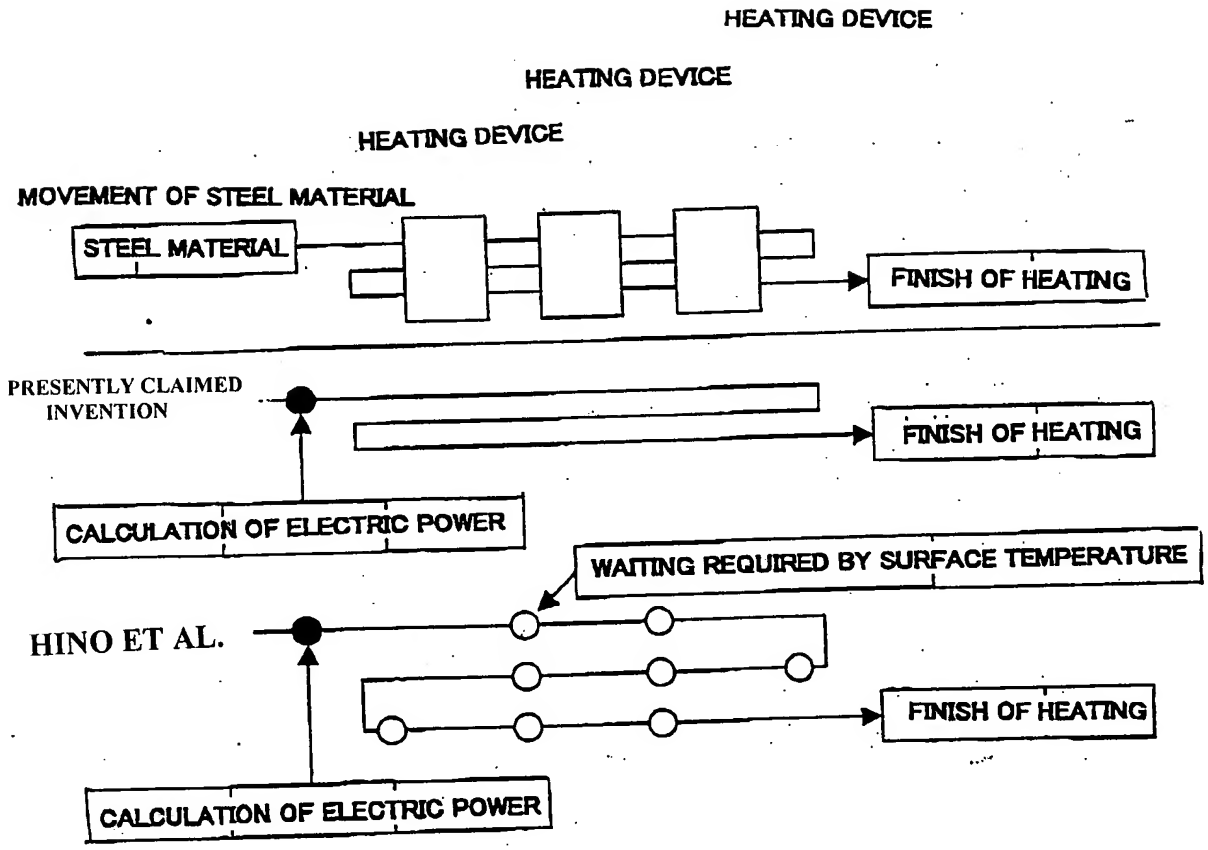


FIG. D DIFFERENCES OF MOVEMENTS OF STEEL MATERIALS BETWEEN APPLICANTS' CLAIMS 5, 8, 12 AND 16 (upper diagram) AND HINO ET AL. (lower diagram)

Hino et al.

The electric power is calculated before heating and, after heating, the temperature is measured and the heating is restarted. At this stage, when the surface temperature is high, it is necessary to wait until the surface temperature reaches or is lower than the mean temperature in the thickness direction of the steel plate.

Applicants' Claims 5, 8, 12 and 16

Before heating, the electric power, the number of times of passage and the transfer speeds are calculated and subsequently, heating is conducted. Because the electric power, the number of times of passage and the transfer speeds are determined in consideration of the surface temperatures according to the presently claimed invention, it is not necessary to measure the surface temperature at every heating time and wait until the surface temperature is decreased, which results in a lowering of efficiency, as is the case in Hino et al.

As recited in claim 2 of Hino et al and disclosed in the description set forth in lines 1 to 3 in paragraph no. [0016] on page 3 of Hino et al., heating is initiated at the time when the surface temperature, before the subsequent heating, reaches a temperature which is equal or under the average temperature in the plate thickness direction of the steel plate, thereby the surface temperature of the steel plate is controlled not to exceed a predetermined temperature. Therefore in Hino et al., the surface temperature of the steel plate is measured each time before passing through an induction heating furnace for heating, and when the surface temperature is high. It is thus required in

Hino et al. to wait until the surface temperature of the steel plate drops to at least a temperature which is an average temperature in the plate thickness direction.

In contrast to Hino et al., in the case of applicants' claims 5, 8, 12 and 16, as set forth in steps (a) to (d), before the steel plate passes through the induction heating furnace for heating, there are calculated the transfer speeds, the electric power, the number of times of passage and the number of units of the induction heating furnace for passing the steel plate for each of the number of times of heating from one time heating, two times or more of heating and N times of heating, under the condition that the surface temperature of the steel plate and the temperature of the inner portion of the steel plate are in a predetermined temperature range beforehand. As a result of the calculations, the number of heating times having the shortest heating time or the number of heating times having the smallest electricity consumption costs is selectively determined.

Applicants' claims 5, 8, 12 and 16 thus result in the following advantages: (i) heating does not have to be suspended in the middle of the heating, as is the case in Hino et al.; (ii) the length of the heating time can be reduced and (iii) the loss

of electricity (energy) caused by radiational cooling, which is brought about by the suspended heating of the steel plate in Hino et al., can be avoided.

It is respectfully submitted that the aforesaid advantageous results afforded by the presently claimed invention are not provided by Hino et al., wherein the method of determining the heating conditions is substantially different than in the presently claimed invention.

As substantiated in the enclosed DECLARATION UNDER 37 CFR 1.132 of Yoshitsugu IIJIMA dated August 26, 2009, the method of applicants' claims 5, 8, 12 and 16 has been applied to practical equipment for the first time in the world, has proven to be extremely effective and has received a very favorable evaluation from the public. In addition, applicants' presently claimed invention has received a large number of technical awards. It is respectfully submitted that the IIJIMA DECLARATION establishes a strong showing of commercial success for the presently claimed invention.

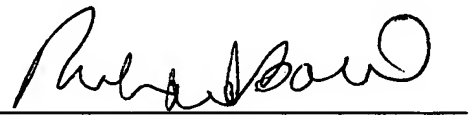
It is therefore respectfully submitted that the presently claimed invention patentably distinguishes over Hino et al.

Withdrawal of each of the prior art rejections is thus respectfully requested.

Reconsideration is requested. Allowance is solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the number given below for prompt action.

Respectfully submitted,



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Enc.: (1) PETITION FOR EXTENSION OF TIME

(2) DECLARATION UNDER 37 CFR 1.132 of Yoshitsugu IIJIMA dated August 26, 2009